What is Claimed:

1. A method of automatically tracing a line-structure comprising an end in an image, the method comprising the steps of:

a. locating a seed point;

b. defining a position and a direction for the seed point;

c. tracing a centerline of the line-structure from the seed point; and

d. stopping the centerline trace at the line-structure end.

2. The method of claim 1 wherein the step of locating a seed point comprises identifying a plurality of candidate seed points and selecting a seed point from the plurality of candidate seed points.

3. The method of claim 2 wherein the step of identifying the plurality of candidate seed points comprises identifying image data points that (1) are a local intensity maximum, and (2) have an intensity of at least a sum of a median intensity value and an intensity standard deviation over the intensity variation of the image.

4. The method of claim 2 wherein the step of selecting the seed point comprises calculating a position intensity and a boundary direction at a plurality of boundary points surrounding the plurality of candidate seed points.

5. The method of claim 4 wherein the step of selecting the seed point comprises evaluating the boundary directions at the plurality of boundary points.

6. The method of claim 4 wherein the step of selecting the seed point comprises evaluating a boundary edge at the plurality of boundary points.

7. The method of claim 2 wherein the step of selecting the seed point comprises calculating an intensity of the image surrounding the candidate seed point.

8. The method of claim 7 wherein the step of selecting the seed point comprises evaluating the intensity homogeneity surrounding the candidate seed point.

9. The method of claim 1 further comprising refining the seed point position by extrapolating toward the centerline from a plurality of boundary points, the boundary points representing positions on a surface of a generalized cylinder, and the seed point representing a position on a center axis of the generalized cylinder.

10. The method of claim 1 wherein the step of tracing the centerline of the line structure comprises translating from the seed point to a trace point.

11. The method of claim 10 wherein the step of tracing the centerline proceeds in a trace direction, the trace direction being the weighted average of a trace direction at a plurality of boundary points.

12. The method of claim 10 wherein the step of tracing the centerline comprises refining a position of the trace point.

13. The method of claim 1 wherein the step of stopping the centerline trace comprises comparing an edge intensity of the line structure at a boundary point surrounding a trace point to a threshold intensity value.

14. The method of claim 13 wherein the step of stopping the centerline trace comprises comparing the edge intensity of the line-structure at a plurality of boundary points surrounding a trace point to a threshold intensity value.

15. The method of claim 13 wherein the step of stopping the centerline trace comprises comparing uniformity of an interior region of the

line-structure with uniformity of a boundary of the line-structure in the image.

16. The method of claim 1 further comprising creating an image analysis output, the image analysis output selected from one of a graph-theoretic or a tabular representation.

17. A method of automatically tracing a line-structure comprising an end in an image, the method comprising the steps of:

a. identifying a plurality of candidate seed points in the image;

b. selecting a seed point from the plurality of candidate seed points, wherein the seed point represents a point on a center axis of a generalized cylinder, the generalized cylinder having a cylindrical surface encompassing the center axis;

c. determining a plurality of boundary points corresponding to the seed point, the boundary points correlating to a plurality of points on the surface of the generalized cylinder;

d. determining a boundary point trace direction at each boundary point and determining a direction perpendicular to the boundary point trace direction at each boundary point;

e. positioning the seed point at an intersection of lines extending from the plurality of boundary points in the direction perpendicular to the boundary point trace direction; and

f. tracing the line-structure to a first trace point on the center axis of the generalized cylinder, the first trace point being a discrete step in the trace direction from the seed point.

18. The method of claim 17 further comprising:

g. determining a second plurality of boundary points corresponding to the first trace point;

h. determining a second boundary point trace direction at each boundary point corresponding to the first trace point and determining a direction perpendicular to the first trace point boundary point trace direction;

i. positioning the first point at an intersection of lines extending from the plurality of first trace point boundary points in the direction perpendicular to the first trace point boundary point trace direction; and

j. tracing the line-structure to a second trace point on the center axis of the generalized cylinder, the second trace point being a discrete step in the trace direction from the first trace point.

19. The method of claim 18 further comprising determining a successive trace point on the center axis of the generalized cylinder, the successive trace point being a discrete step from a previous seed point.

20. The method of claim 17 wherein the step of tracing the line-structure comprises determining the trace direction by calculating a weighted average of the boundary point trace directions.

21. The method of claim 17 wherein the step of identifying the plurality of candidate seed points comprises identifying image data points that (1) are a local intensity maximum, and (2) have an intensity of at least a sum of a median intensity value and an intensity standard deviation over the intensity variation of the image.

22. The method of claim 17 further comprising determining an end of the line-structure.

23. An image analyzing system to automatically trace a line-structure comprising an end, the system comprising;

a. means for locating a seed point on the line-structure in an image;

b. means for defining a position and direction for the seed point;

c. means for tracing a centerline of the line-structure from the seed point; and

d. means for stopping the centerline trace at the line-structure end.

24. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform the method steps for automatically tracing a line-structure comprising an end in an image, the method steps comprising:

a. locating a seed point on the line-structure in an image;

b. defining a position and direction for the seed point;

c. tracing a centerline of the line-structure from the seed point; and

d. stopping the centerline trace at the line-structure end.

25. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform the method steps for automatically tracing a line-structure comprising an end in an image, the method steps comprising;

a. identifying a plurality of candidate seed points in the image;

b. selecting a seed point from the plurality of candidate seed points, wherein the selected seed point represents a point on a center axis of a

generalized cylinder, the generalized cylinder having a cylindrical surface encompassing the center axis;

c. determining a plurality of boundary points corresponding to the selected seed point, the boundary points correlating to a plurality of points on the surface of the generalized cylinder;

d. determining a boundary point trace direction at each boundary point and determining a direction perpendicular to the boundary point trace direction at each boundary point;

e. positioning the selected seed point at an intersection of lines extending from the plurality of boundary points in the direction perpendicular to the boundary point trace direction; and

f. tracing the line-structure to a first trace point on the center axis of the generalized cylinder, the first trace point being a discrete step in the trace direction from the selected seed point.